**Template | Unit Enhancement**

***EXPLANATION & ARGUMENTATION***

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**Background Information**

**Instructional Materials Title: Foss Levers and Pulleys**

**Publication Date: 2005**

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**Date Developed: Aug 23, 2013**

**High Leverage Lesson : Investigation 1**

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**Rationale**

· **This lesson was designed to introduce students to CER framework. This unit is the first taught in the fall. Students previously exposed to CER framework may not need the scaffolding found in the first lesson.**

**- Connections to NGSS Practices and WA Science Standards**

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***Explanation* Lesson Enhancement**

**Overview**

· **Identification of where within the High Leverage Lesson to insert enhancement**

· **Key instructional strategies and tools needed**

**Part 1: Lesson Modifications to Lead Up to *Explanation* Experience**

These modifications replace Part 1 of Investigation 1.

Day 1 – Setting the Stage

1. Teacher Lift Challenge (set up TG p11, step 12 – Implementation TG p14, step 1)
2. Student Exploration of Lever Systems (Implementation TG p 14 step 6)
   1. Note: Only use set up – do not ask the probing questions included in the TG (students will do that later).
   2. At this part in the lesson Lever vocabulary can be introduced at teacher discretion but it is not necessary at this time (will be a later focus) (skip steps 2-5 - can be done later)
3. Introduce Investigative Question: (intentionally basic/nontechnical) What is the effect of how far your finger is from the binder clip on how hard it is to lift the load? Note: Remind students that changing the distance of their finger from the binder clip is their **one** changed condition (MV). They must leave the load at one position.
4. Distribute Predictions Handout: (Split class in to two groups. One group will have prediction A, the other prediction B. They will seek evidence to support or dispute their assigned prediction. The purpose of this is to maintain 2 claims throughout the process and to provide an opportunity for argumentation- although not specifically addressed here)
   1. Predictions:
      1. Student A says: When my finger is closer to the binder clip it is easier to lift the load
      2. Student B says: When my finger is farther away from the binder clip it is easier to lift the load.
   2. Students make and record observations to support or dispute their prediction.
   3. Students write a “cold” explanation to report their findings. This writing is done without class or group discussion.
   4. If time permits, students could discuss their findings AFTER completing and turning in the worksheet.
   5. Collect representative sample of student work to bring to Oct meeting.

Day 2: Introduce C-E-R framework

1. Introduce the framework, using a real life example of a claim that is relevant to kids. The introductory example should be non-scientific example with more subjective evidence. (An example may be found in the reference materials from: Supporting Grade 5-8 Students in Constructing Explanations in Science; supplemental video clip 2.1 – Ms. Nelson introduces the framework
2. Students take notes on a graphic organizer to learn the framework

|  |  |  |
| --- | --- | --- |
| Definition | Teacher Example | Example from Lever exploration explanation |
| Claim  A statement that answers the question  It can be one sentence! | Brett Farve is the best quarterback ever. |  |
| Evidence (Prove it!)  Facts or Data that supports the claim |  |  |
| Reasoning  Explains why what it all means  Explain and discuss  Use science ideas to show how evidence supports claim  Identify why the evidence is important |  |  |

1. Using the written work from Day 1, students identify the CER framework in their writing and transfer those parts into the graphic organizer. We anticipate that students will have a “hole” in the reasoning area.
2. Discuss how better evidence strengthens the claim. (Goal: students suggest use of quantitative data rather than qualitative data.) Rationale: Scientific reports should enable other investigators to repeat the study to check the results, feeling is difficult to reproduce.

Day 3: Introduce Spring Scales & Vocabulary

1. Intro to Spring Scales (TG p15 step 9-13) and lever vocabulary (p 13 step 2,4)
2. Students may need additional math instruction to work with decimals. An introductory lesson of decimals is found in Investigation 1, p. 30.

Day 4: Obtaining Quantitative Data & Student revision of Explanation using CER framework *Students will need a blank CER form to rewrite their explanation.*

1. Students collect quantitative data for evidence to revise their explanation. *This is an unguided activity, allowing students to determine data to collect, how to record that data, and perform the activity.*
2. Using quantitative data collected, students revise their explanation but include quantitative data and lever vocabulary.
3. Question: How can we strengthen the evidence (data) even more? We need repeated trials to verify results, use average of data points obtained.

Day 5: Lever Experiment A

1. Students conduct Lever Experiment A with modified Investigative Question What is the effect of the position of the effort on the amount of effort required to lift the load?
2. Students *write* explanation, *using CER framework. (See Lever Experiment A CER worksheet) Students are to include data, use scientific vocabulary*. Students will calculate average values using other group’s data.

Day 6: Lever Experiment B

1. Students Conduct Lever Experiment B - What is the effect of the position of the load on the amount of effort required to lift the load?
2. Students write explanation using CER Framework. Reminder: This is our students’ first practice completing CER “on their own”. There is a rubric for scoring Lever Experiment B explanation.
3. This is one piece of student evidence you will bring to the October meeting. (Bring your whole sample set even if we don’t get to them. Copies or scanned documents are fine. More details to come)

**Part 2: *Explanation* Learning Sequence**

**Part 3-A: Describe Assessment Task**

*Include the* ***question****,* ***evidence*** *students will use, and* ***scientific concepts*** *students will use in their reasoning.*

See Document: Lever Experiment B Rubric

**Part 3-B: Assessment Rubric**

See Document: Lever Experiment B Rubric

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**Additional Information**

NOTES

· Information that will be useful when teaching this lesson

- Resources that will be useful

- Scaffolds that students will use